PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Decrease Sedimentation And Temp. In Streams, Educate Resource Managers

BPA project number: 20051
Contract renewal date (mm/yyyy): ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Oregon State University Extension Service

Business acronym (if appropriate) OSU EXT

Proposal contact person or principal investigator:

Name	Michael Stoltz
Mailing Address	102 Ballard Hall, Oregon State University
City, ST Zip	Corvallis OR 97331
Phone	541/737-2711
Fax	541/737-4423
Email address	michael.stoltz@orst.edu

NPPC Program Measure Number(s) which this project addresses
7.6 B1, B3 & B6, 7.6C, 7.6D, 7.8D1

FWS/NMFS Biological Opinion Number(s) which this project addresses
Endangered Species Act - Section 7 Consultation, III Listed Species & Critical Habitat. Threatened: Snake River fall, summer, spring Chinook Salmon; Snake River & Lower Columbia River Steelhead. Endangered: Snake River Sockeye Salmon

Other planning document references
Oregon Department of Agriculture and Oregon Department of Fish and Wildlife have requested OSU Extension involvment. Watershed Councils have requested educational help from OSU Extension

Short description
MULTI-YEAR PROJECT Reduce sedimentation, water temperatures, in Oregon's salmon streams. Educate natural resource managers to facilitate widespread management changes to benefit fish and wildlife

Target species
anadromous fish

Section 2. Sorting and evaluation

Subbasin
Grande Ronde, Imnaha, Deshutes, Fifteenmile, Hood, John Day, Umatilla, Walla Walla, Malheur, Owyhee, Mid Snake-Powder

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
☒ Anadromous fish ☐ Resident fish ☐ Wildlife	☒ Multi-year (milestone-based evaluation) ☐ Watershed project evaluation	☒ Watershed councils/model watersheds ☒ Information dissemination ☐ Operation & maintenance ☐ New construction ☒ Research & monitoring ☒ Implementation & management ☐ Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
9005	Irrigation system replacement Trout Creek @ Willowdale II '99 funds	Supports riparian enhancement, livestock management changes
9012	Mitigate effects of runoff & erosion on salmonid habitat in Pine Hollow	Supports improving riparian vegitation, reducing water temp., recover stream morphology
9045	Eliminate gravel pushup dams on Lower North Fork John Day	Supports improving riparian vegitation
9133	Bakeoven riparian assessment	Supports riparian work & exclosure fence
9139	Acquisition of Pine Creek Ranch	Supports riparian & upland area improvements, fencing, lvstk mgnt
8339200	Grande Ronde	Supports riparian habitat improvements
8400900	Grande Ronde	Supports riparian habitat improvements
8402100	Protect & enhance John Day River fish habitat	Supports riparian habitat improvements, fencing, landowner agreements
8402500	Protect & enhance fish habitat in Grande Ronde Basin streams	Supports riparian habitat improvements
8402700	Grande Ronde	Supports habitat improvement implementation
8710000	Umatilla	Supports habitat improvement
8710001	Enhance Umatilla River Basin anadromous fish habitat	Supports habitat improvements, fencing, bank stabilization, plantings
8710002	Protect & enhance coldwater fish habitat in the Umatilla River Basin	Supports habitat improvements, fencing, bank stabilization, plantings
9202601	Grande Ronde Model Watershed project support, planning	Provides specific training and support for watershed councils, supports habitat enhancement
9304000	Fifteenmile Creek habitat restoration project	Supports riparian habitat improvement
9402700	Grand Ronde Model Watershed habitat	Supports implementation habitat

	projects	improvements
9403900	Wallowa Basin project planning	Provides specific training and support for watershed councils
9604500	Umatilla	Supports habitat improvement work
9607700	Grande Ronde	Supports habitat monitoring
9608300	Upper Grande Ronde habitat enhancement	Supports habitat improvement work
9701100	Owyhee Shoshone/Paiute habitat enhancement	Supports habitat improvement work, grazing management
9702500	Implement the Wallowa Co./Nez Perce Tribe salmon recovery plan	Supports Grande Ronde habitat implementation

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
	new project	

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Reduce sedimentation in salmon streams from dryland farming	a	Intensify grower and field reps education on annual crop, conservation tillage and no-till, meetings, tours, workshops (winter/spring '00)
		b	Implement no-till cost share program (Feb '00)
		c	Conduct one on one contacts, set up comparisons i.e. fertilizer placement, etc (spring '00)
		d	Monitor plant stands, comparisons (summer '00)
		e	Gather yield, acreage data, produce reports (fall '00)
		f	Use data, reports in next years meetings (winter '01)
2	Promote public outreach and encourage education in watershed and resource management and protection	a	Make contacts and schedule meetings (Oct '99)
		b	Print support materials and workbooks (Nov '99)
		c	Conduct meetings (winter/spring '00)
		d	Evaluate effectiveness of meetings (summer '00)
		e	Produce reports, make needed changes (fall '00)
3	Stabilize stream banks, increase shading, improve riparian vegitation of target	a	Select improvement sites & monitoring locations, conduct PFC analysis (spring '00)

	streams		
		b	Install changes, i.e. off stream watering, etc (spring ’00)
		c	Monitor flow, temp., nutrients, take photos & notes (summer ’00)
		d	Gather data, compile for each & across sites, compare to stream type sites in good condition (fall ’00)
		e	Produce reports, make needed changes (fall ’00)
4	Assess watershed health (temperature) on representative stream types in Eastern Oregon	a	Select sites & monitoring locations, conduct PFC analysis (spring '00)
		b	Monitor flow, temp., nutrients, take photos & notes (summer ’00)
		c	Gather data, compile for each & across stream types, compare to sites with improvements (fall ’00)
		d	Produce reports (winter ’00/’01)

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	11/1999	11/2003	save 149,000 tons of soil	13,000 A no-till	
2	11/1999	11/2003		21 ed meetings	
3	11/1999	11/2003		30 improve sites	
4	11/1999	11/2003		12 tempert. sites	
				Total	0.00%

Schedule constraints
very dry springs that render unprofitable any annual cropping, extream flooding that destroys riparian improvements

Completion date
December 20, 2003

Section 5. Budget

FY99 project budget (BPA obligated): $0

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	4 coordinators @ $40K, 1 project mgr/coord @ $50K	%24	210,000
Fringe benefits	32%	%8	67,200
Supplies, materials, non-expendable property	HOBO's, flow meters, locators, tapes, 5 computers @$3,000, other	%11	99,300
Operations & maintenance	material, weigh wagons, workbooks,	%2	15,770

	nutrient samples		
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%0	
NEPA costs		%0	
Construction-related support		%0	
PIT tags	# of tags:	%0	
Travel		%5	47,500
Indirect costs	20.3% for off campus	%12	105,107
Subcontractor	non OSU temporary help, include in indirect cost charge	%6	53,000
Subcontractor	to help county paid expenses, include first $25K in indirect costs	%9	80,000
Other	incentives: no-till, stream site equip such as electric fence, solar panals, no indirect charge cost	%23	205,000
		TOTAL BPA FY2000 BUDGET REQUEST	$882,877

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
OSU Extension	dryland PI@ 20%	%1	13,000
"	stream PI @ 10%	%1	13,000
"	18 Agents @ 10%	%12	120,600
		%0	
		Total project cost (including BPA portion)	$1,029,477

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$918,192	$954,920	$993,117	

Section 6. References

Watershed?	Reference
☐	Agriculture Statistics. 1996. USDA, Portland OR
☐	Barton, D.R., W.D. Taylor, and R.M. Biette. 1985. Dimensions of riparian buffer strips required to maintain trout habitat in southern Ontario streams. N. Am. J. Fish Management 5:364-378.
☐	Brown, G.W. and J.T. Krygier. 1970. Effects of clearcutting on stream temperature. Water Resources Research 6(4):1133-1139.
☐	Chamberlain, D. 1998. Unpublished data. Harney County Extension Office, Courthouse, 450 N Buena Vista, Burns OR 97720
☐	Conway, F. 1997. WSEP workshops. Extension reports of accomplishment. Oregon State University Extension Service, 102 Ballard Hall, OSU, Corvallis OR 97331
☐	Delaney, G. 1997. Individual water quality planning workshops. Extension reports of accomplishment. Oregon State University Extension Service, 102 Ballard Hall, Corvallis OR 97331
☐	Dickard, M.L., C. Hunt, P.A. Momont, N.R. Rimbey, T. DelCurto, J.A. Tanaka. 1998. Paper Presentation. Offstream water and salting as management stratagies for improved cattle

	distribution and subsequent riparian health.
☐	Larson, L. and S. Larson. 1996. Riparian shade and stream temperature: a perspective. Rangelands 18(4):149-52.
☐	Marlow, C.B., T. M. Pogacnik, and S.D. Quinsey. 1987. Streambank stability and cattle grazing in southwestern Montana. J. of soil and water conservation 3:291-296.
☐	Meisner, J.D. 1990. Effect of climatic warming on the southern margins of the native range of brook trout, Salvelinus fontinalis. Can. J. Fish. Aquatic Science 47:1065-1070.
☐	Miller, B.C., E. Adams, P. Peterson and R. Karow. 1992. On-Farm Testing: A Grower's Guide. Extension Bulletin 1706. Washington State University Cooperative Extension, Pullman, WA.
☐	MOU # 1425-8-MU-10-02170, Oregon Dept. of Ag, Salem OR
☐	Prichard, D. 1993. Riparian area management: Process for assessing proper functioning conditon. USDI, Bureau of Land Management, TR 1737-9.
☐	Rasmussen, P.E., R.W. Smiley and B. Duff. 1993. Biological and economic sustainability of wheat/fallow agriculture. pp 13-22. In 1993 Columbia Basin Agriculture Research annual report, Spec. Rept. 909. Oregon State University Agri. Exp. Stn., Corvallis
☐	Rosgen, D. 1996. Applied river morphology. Wildlife hydrology, 1481 Stevens Lake Rd, Pagosa Springs CO 81147
☐	Smiley, R.W. 1998. Personal communication. Columbia Basin Agriculture Research Center, PO Box 370, Pendleton OR 97801
☐	Stoltz, M. and R. Karow. 1997. Dryland working group. Oregon Invests. Oregon State University College of Agriculture Science, 126 Strand Hall, Corvallis OR 97331
☐	Ward, J.V. 1985. Thermal characteristics of running waters. Hydrobiologia 125:31-46.
☐	Wolman, M.G. and J.P. Miller. 1960. Magnitude and frequency of forces in geomorphic processes. J. Geology 68:54-57.
☐	USDA Forest Service. 1992. Integrated riparian evaluation guide. Intermountain Region, Ogden Utah.

PART II - NARRATIVE

Section 7. Abstract

There is tremendous soil erosion from the dryland wheat areas of Oregon's Columbia Basin due to the summerfallow system of cropping using the moldboard plow. This grant using very limited producer incentives for no-till planting and extensive one on one consultation will dramatically reduce erosion and resulting sedimentation in salmon streams by increasing annual cropping and particularly no-till annual cropping. In four years this project will directly affect 92,000 acres. The adoption of the practices will be much larger. The long-term goal is 250,000 acres in an annual crop no-till system with more acres in conservation till annual crop system. Results will be monitored and evaluated by one on one consultation and using the Agriculture Statistical Reporting Service data.

Land managers are very distrustful of the water quality planning process according to Andrews and Greer, the heads of Oregon Departments of Agriculture and Fish and Wildlife respectfully. Watershed councils are working with the process and agencies, councils and individuals are asking for OSU Extension's help. Workshops and workbooks, other materials, for individuals and groups working on water quality have been pilot tested by Extension. Workshops for Watershed Councils will be conducted where requested, workshops for individuals to develop water quality plans will be conducted as each involved Extension agent requests them. The '94 CB Fish and Wildlife Program speaks directly to educating individuals, volunteers and groups on water quality issues and getting more plans and improvements on the ground. Agents will tabulate how many participants complete plans. In four years most of the Watershed Councils and individuals interested in water quality plans should have access to workshops.

Proper Functioning Condition is an observation method of determining stream quality and stability. The major government agencies have agreed to use PFC as their quality-determining tool. Most riparian vegetative damage and stream bank instability is in certain segments of streams. The loss of vegetative cover and bank erosion results in higher water temperature and increased sedimentation of salmon streams and a lower PFC rating. This project would target about 30 damaged stream segments in Oregon's Columbia River and Snake River drainages. Each segment would have a PFC assessment done by OSU.

By using limited producer incentives for cash costs on off stream watering systems (nose pumps, solar or gravity powered), electric fencing, hardened crossings, planting, and by changing the season and duration of grazing, this project will increase riparian vegetation, reduce sedimentation and water temperature, and result in positive changes to stream morphology. Extension pilot tests have shown that by the fourth year fencing may not be needed due to the rank growth of vegetation. At the end of four years dramatic differences may be seen. Photo points and extensive temperature, flow, and nutrient analysis will be completed on the stream segments. Extension tours and meetings for land managers, and professional presentations and articles will assure information/technology transfer. Land managers and groups will be encouraged to use GWEB and CREP funds to implement the changes on more streams.

There are several main types of streams in Eastern Oregon. Water temperature has become one of the standards by which to measure water quality for salmon. There is a large debate about whether a 64* F water temperature can be attained on all streams. It is not known if streams of the different types but in the same PFC will have different water temperatures. It is not known how much water temperature will change with a change in PFC. The lack of this knowledge is causing many land managers to distrust the planning system and to not invest in changes that may benefit their water quality.

Twelve stream segments in Eastern Oregon's Columbia Basin, in very good PFC, will be analyzed for water temperature and nutrients. Four streams will be used from each of the three dominant types in Eastern OR. Measurements will be taken June through September of each year

There are 11 Extenson Agents collecting stream temperature data in Oregon. At this time there is not a base line of temperature data related to water/stream quality. This project will expand the data collection and make comparisons. It will answer some of the unknowns about water temperature related to stream quality and nutrients and will give land managers and agencies data to make informed decisions about water quality plans and implementation. This study will assess the three dominant stream types in Eastern Oregon as well as do a reach by reach assessment of 30 streams with problems.

Section 8. Project description

a. Technical and/or scientific background

1. Reduce sedimentation in salmon streams from dryland farming: The winter wheat summer fallow monoculture cropping system of Oregon's Columbia Basin in 9" to 20" rainfall zone is not sustainable, either biologically or economically (Rasmussen, Smiley, Duff, 1995). According to the Agriculture Research Service and NRCS this cropping system is subject to tremendous water erosion problems, especially when rain falls on frozen soils. Summer fallow has decreased the soil organic matter to half or less of its original levels under native grassland contributing to erosion and crusting problems after seeding dryland crops.

The normal soil erosion on plowed fallow systems after winter wheat is planted is 10 – 12 tons of soil per acre in areas averaging 60+ bushels per acre of winter wheat. The soil erosion is 5 tons of soil per acre in areas averaging 45 bushels per acre. (NRCS Rusle formulas)

In Oregon's Columbia Basin dryland fallow farming systems there are about 209,000 acres in 60+ bushels per acre areas and 417,000 acres in 45 bushels per acre areas average yield of winter wheat. (Agriculture Statistics, 1996) Counties included are Wasco, Sherman, Gilliam, Morrow and Umatilla. Wallowa County has an additional 54,000 acres of high erosion potential cropland (10-12 tons soil loss per year).

Annual cropping, compared to winter wheat fallow, saves approximately 6 tons of soil per acre on 60 bushel winter wheat per acre land and 3 tons per acre on 45 bushel per acre land. No-till annual cropping drops the soil erosion to near zero per acre. (NRCS Rusle formulas)

No-till seeding was tried in the Columbia Basin in the early 1980's. It was a failure due to a lack of alternate crops, a lack of proper registered pesticides, resulting in extreme weed and disease pressure. The high cost of the equipment just before the farm crisis of the mid 1980's put most of the participants out of business.

OSU Extension and Research have done substantial work in Oregon's Columbia Basin on alternate crops such as canola, mustard and lentils and annual cropping since 1986. Registered pesticides are available for alternate crops; fertilizer rates, timing and application methods such as spoke wheel injection have been researched, introduced and are being adopted. In 1996, '97 and '98 Extension conducted a series of annual spring crop demonstrations in the Columbia Basin resulting in positive returns to growers. (Stoltz, Karow, Dryland Working Group, Oregon Invests, 1997)

In 1997 an EPA grant from Geographic Resource Initiative funds was obtained targeted to only the Umatilla River watershed. The grantees, Extension and the local SWCD, proposed to plant over 4000 acres of farmer's fields using no-till drills. The grant paid producer incentives of $10 per acre seeded with no-till equipment up to 200 acres for any one producer. There was a lot of interest by growers and over 6800 acres were planted using the cost share. There are substantial problems with no-till, disease, weeds, insects and rodents. (Smiley, personal communication, 1998)

Extension made one on one contact with every grower involved to discuss rotations, seeding rates, fertilizer, herbicides and varieties to enhance the chance of success. A very dry spring and heat at flowering time reduced some yields. Growers considered the experience a success as it paid more than cash expenses. The following winter wheat crop will determine ultimate success. EPA extended the grant for the '98-'99 growing season for just over 5000 acres. An extremely dry year or particularly a dry spring could decrease interest and the chance of success.

The limited producer incentives for no-till seeding allows growers to try the new technology with a minimum of financial risk, extremely important at today's reduced commodity prices.

2. Promote public outreach and encourage education in watershed and resource management and protection: Senate Bill 1010 allows for basin water quality plans. It also allows individuals to develop water quality plans for the lands that they manage. The individual plans should dovetail with the basin plans. While the basin planning is now going on in some areas other areas may not be done for some time.

Individuals are reluctant to engage in a process they are unfamiliar with but now is when they will have time to formulate a plan without a lot of pressure.

Extension Agents Gary Delaney of Grant County and Bill Rogers of Lincoln County conducted pilot workshops on individual water quality plans in 1997. Workbooks were developed with OSU Rangeland Resource Extension Specialist Mike Borman. (Delaney, Rogers, OSU Extension Reports of Accomplishment, 1997)

There are a very limited number of educational programs that teach watershed councils and other citizens about watershed processes, fish needs, water quality, monitoring, different enhancement practices, how to create successful partnerships, facilitate meetings, improve communications, etc.

A group of Extension Agents and Specialists led by Flaxen Conway, Mike Cloughsey, and Derik Godwin on Oregon's west side developed a more comprehensive Watershed Stewardship Educational Program (WSEP) model with curriculum, training materials and learning aides. This model enables target audiences to form effective partnerships, assess conditions and develop strategies for mitigating or enhancing their water resources, and then implement effective enhancement projects. In addition the workbook could be used by a large variety of other audiences (volunteer interest groups, livestock and small woodland associations, policy makers, etc.). (Conway, OSU Extension Reports of Accomplishment, 1997)

Money and personnel are needed to take these two programs on the road to target audiences, watershed councils, individuals, and other groups.

3. Stabilize stream banks, increase shading, improve riparian vegetation, of target streams:

There are approximately 910 streams in Oregon that do not meet water quality standards, about 500 of those are because of too high a temperature. These are on what is know as the 303d list.
The BLM, NRCS, USFS have signed an agreement to use Proper Functioning Condition (PFC) to assess the physical function and sustainability of streams in the Western U.S. PFC does not require many years of data collection but can be done as a point in time analysis.

The thermal characteristics of running water are determined by numerous interrelated factors, which can be categorized into three components: hydrology, insolation, and climate. The extent to which insolation influences stream temperature is determined by vegetation cover, channel morphology and topographic features. Wide or braided stream channels generally experience wider temperature fluctuations because they expose a greater water surface to direct solar radiation. The removal of trees along low order streams in forested areas has been shown to cause a significant increase in stream temperature (Brown and Krygier 1970). Barton et al (1985) found that within broad, flat valleys aspect was more important than percent canopy cover in determining stream temperature. The source of water, the relative contribution of groundwater and the flow or discharge of the stream are the most important hydrological factors impacting the thermal characteristic of lotic ecosystems. Groundwater provides baseflow and moderates the effect of seasonal air temperature fluctuations. Meisner (1990) found groundwater discharge maintained cold water habitat in headwater streams while shade performed an accessory role by reducing insolation.

Any significant alteration of the factors that determine the natural temperature regime of running waters may directly or indirectly modify local thermal conditions (Ward 1985). In the arid and semi-arid West cattle grazing has been documented to cause decreases in riparian plant community stability and water quality due to removal of protective vegetation and trampling of streambanks (Marlow et al 1987). Reduction in vegetation cover may alter the thermal pattern within the stream, which could negatively impact the aquatic vertebrate population. Unstable banks may lead to accelerated channel erosion and higher instream sediment loads leading to changes in stream channel morphology.

Changes in the width and depth of the channel could have profound impacts on stream temperature. The capability of a stream to buffer against temperature change is influenced by the stream volume and the amount of surface area exposed to solar radiation (Larson and Larson 1996). Research is lacking on the role stream channel characteristics play in determining the thermal regime of the water column.

Riparian grazing research has focused on correcting cattle impacts on riparian vegetation (Marlow et al 1987). More information is needed on the relationship between grazing season and grazing intensity on channel morphology. Understanding the relationship between channel morphology and stream temperature and channel morphology and grazing will allow rangeland managers to develop water quality plans and positively impact stream temperature.

The Malheur Lake watershed has been identified as a potential site for research. Private landowners within the upper portion of the watershed have agreed to cooperate with Oregon State University, Department of Rangeland Resources researchers in stream temperature projects. Proper functioning condition assessments (Prichard 1993) have been completed on 15 stream segments within the watershed. Measurement of vegetative shade potential along the two primary streams within the watershed has been completed. A model for predicting potential shade or view to sky throughout a specified day is currently being developed. Two miles of the Silvies River, which has been historically grazed during the fall and winter, was fenced in the fall of 1997 with an additional mile scheduled for fencing in the fall of 1998. This fencing project provides 3 large riparian pastures.

There is some concern that phosphate and nitrogen loading is high enough to affect stream water quality and this issue should be addressed so land managers have some idea if it is or is not a potential problem.

The Union Livestock Experiment Station and the OSU Agriculture and Resource Economics Department have completed 4 years out of a 5 year study on off stream watering effects on steam health. Stream health may be improving (PFC) and there is a positive return to the cattle owner due to better livestock distribution. (Dickard 1998)

The Harney County Extension Agent has two stream segments with off stream watering, using solar powered water systems and electric fence to exclude livestock from stream segments. In 3 years the riparian vegetation has increased dramatically. In one site exclusion fence may not be needed the fourth year due to the rank growth. The result has been improvement to a critical part of the stream, better livestock distribution, and use of the grazing permit for two to three weeks longer. In both cases only about 5 acres needed to be protected out of 3000 and 5000 acre grazing permits. (Chamberlain, unpublished data, 1998)

There are 11 Extension Agents with livestock/range responsibilities in Oregon who are doing some type of temperature measurements in streams. There is a memorandum of understanding between 15 agencies, including OSU Extension, to study temperature on the Burnt River in Eastern OR. (MOU 1998)

The problem is not enough improvements are being made in damaged riparian areas, which results in sedimentation and raising stream temperatures. Also there is not enough help to coordinate and analyze the data already being collected. There are only individual reports. This project would allow Extension to collect data already being taken, add to the data where needed, make comparisons across sites, and present the information to a much larger audience that can use it to make positive changes to streams.

4. Assess watershed health (temperature) on representative stream types in Eastern Oregon

It is not known if temperatures vary by stream type, even if they are in about the same quality condition. It would seem logical that it would vary but by how much? It is not known how much temperature may change with a change in stream quality (as measured by PFC or some other method) If land managers knew this information they would be much more likely to make management changes that would affect stream quality. They would have some assurance that a change could allow the stream to meet a standard i.e. 64* F stream temperature. They would also know if the standard was possible to meet with management changes, or whether they should petition to have the standard changed. There is so much unknown now that people are reluctant to work on plans or make management changes that involve significant investment in time, capital, or both.

Note: many of these studies use multiple sites and not replicated trials in the same site. Multiple sites can be used in place of replications for a scientific study and have been found to be very reliable. (Miller et.el. 1992) The methodologies and results will be peer reviewed by scientific experts for professional presentations and articles.

b. Rationale and significance to Regional Programs

At the Oregon Cattlemen's meeting in Bend, November, 1997, Bruce Andrews, Oregon Department of Agriculture director and Jim Greer, Oregon Department of Fish and Wildlife director, stated that they needed Extension Services' help in bringing land managers to the planning table. They further stated that there was some distrust by land managers and they would have a very hard time making the planning process work without Extension's help.

This project will allow the OSU Extension Service, to have tours of demonstrations, meetings and workshops on annual crop and no-till and on riparian habitat restoration. These meetings and tours, ran with cooperating agencies and groups, directly relate to Section 7.6 B, Habitat Policies; "encourage local cooperation and coordination to address habitat protection and improvement activities and to resolve problems created by competing missions". Extension has an excellent track record in bringing opposing parties together and has a large clientele base in the natural resource industries. Extension has also found that getting producers involved in demonstrations, in tours, greatly reduces distrust and fear. The axiom that action conquers fear is true.

The 1997 pilot workshops and workbooks for individual water quality plans developed by Gary Delaney and Bill Rogers, OSU Extension Agents in Grant and Lincoln counties respectfully were very successful. A task force of Agents in the Agriculture, Forestry, and Sea Grant Extension areas developed a Watershed Stewardship Educational Program (WSEP). This program enables target audiences to learn how to form effective partnerships, to assess conditions and develop strategies for mitigating or enhancing their water resources, and to implement effective enhancement projects. These workshops will be expanded to cover the affected counties and will involve Extension Agents, DEQ and ODA local representatives and technical groups, SWCD boards, and NRCS personnel.

The workshops for individuals and the WSEP directly relates to the 1994 Columbia River Basin Fish and Wildlife Program Habitat Policies. 7.6B.1, "encourage private parties to be proactive and to work cooperatively with resource managers to maintain and improve habitat". Also it relates directly to 7.6B.6, "encourage the involvement of volunteers and educational institutions in cooperative habitat improvement projects. Promote public outreach and encourage education in watershed and resource management and protection throughout the basin".

This project will result in more acres converted to annual cropping and no-till seeding thereby reducing soil erosion and stream sedimentation from dryland farming. It will also result in less streambank erosion and sedimentation; lower stream temperatures and increased riparian vegetation on livestock grazed land in the Columbia Basin. These directly relate to Section 7.6 D, Habitat Objectives; "no increase in sedimentation due to human activity, increased bank stability, lower water temperature, more desirable riparian vegetation", as listed in the 1994 Columbia River Basin Fish and Wildlife Program.

The temperature and flow monitoring in the best condition three representative types of streams in Eastern Oregon is related to the Fish and Wildlife Program in section 7.6C, Watershed Assessment. "Local watershed committees and public land managers should cooperate to assess watershed health on a stream reach by stream reach basis. Methodologies and results should be peer reviewed to ensure appropriateness and quality of data." As stream health is being measured by temperature this data could be crucial to public and private land managers planning decisions. Extension research data is peer reviewed before publication

c. Relationships to other projects

The projects listed in Section 3 seek to reduce sedimentation but do not address soil erosion from farm fields. This project, in Umatilla, Morrow, Gilliam, Sherman, Wallowa and Wasco Counties will significantly decrease the soil erosion from winter wheat fields and the resulting sedimentation of salmon streams.

The projects listed seek to improve riparian or upland habitat through revegetation, fencing, livestock management, bank stabilization, etc. This project will significantly add to the knowledge of how grazing

management can return stream morphology to one that results in colder, cleaner water. Up to 30 sites will add to the knowledge of how management changes, i.e. off stream watering, electric fences to protect damaged sites, etc., can make big differences in stream morphology, riparian habitat and bank stabilization at fairly low cost. The project will encourage land managers to apply for cost share funds such as CREP and for GWEB grants to implement these techniques. This will multiply the efforts started by the related projects. The water temperature by stream type data will support land managers making changes in their operations because they will then know what temperature it is possible to reach. It will also help the planning process as people will have a better idea of what to put in their plan that will actually make a measurable difference.

Two projects, Wallowa and Grande Ronde, directly support project planning. This project will provide training and education on group processes, forming partnerships, addressing conflict, etc. It also has a curriculum on watershed issues that has been well pilot tested. The workbooks and education will assist watershed groups, SWCD's, technical committees and others in completing their tasks.

This project will also educate people interested in developing their individual water quality plans through pilot tested workbooks and training meetings. With more successful projects on the ground and training in groups and for individuals there will be better plans and more and better projects developed.

d. Project history (for ongoing projects)

New project

e. Proposal objectives

1. Reduce sedimentation in salmon streams from dryland farming. Extension specialists and Agents will work with researchers and farmer cooperators to change farming systems. Emphasis will be on agronomics and on economics and using the growers or custom equipment. These new systems must allow the producer to survive economically. With meetings, tours, demonstrations and one on one consultation farmers will convert crop fallow systems to annual crop systems. By using limited producer incentives and extensive coordination with no-till manufactures and drill owners more land will be annual cropped using no-till.

Outcomes: convert 20,000 acres each year of crop fallow to annual cropping systems.
Seed 13,000 acres of the annual crop with no-till technology each year.

Results: reduce erosion to zero on 13,000 acres no-till from 8 tons average soil loss per acre. Reduce soil erosion by 4.5 tons average per acre on 10,000 acres conservation till annual cropped. Total tons soil saved 149,000 tons per year.

Long term goal: 250,000 acres annual cropped no-till resulting in 1,600,000 tons of soil saved per year. (One third of the acres at 10 tons per acre and two thirds of the acres at 5 tons per acre) Additional 150,000 acres conservation till annual cropped resulting in 675,000 tons of soil saved per year. Total soil savings will be 2,275,000 tons of soil saved per year and not contributing to sedimentation.

2. Promote public outreach and encourage education in watershed and resource management and protection.
Extension Agents and Specialists will work with their clientele at workshops for developing individual water quality plans. The workshops will be coordinated with the ODA and DEQ technical specialists in each area. With additional help Extension would be available for individual consultation before and after the workshops. The workbooks
and workshops have been pilot tested in 1997 and 1998.

Land managers are waiting until their basin plan is completed. There may be some time before all these are done. In the meantime, individual plans could be developed. People would have time to think them

through, consider changes, form partnerships, and they could be easily modified when the basin plan is completed. The result should be better plans, more coordination, and a better understanding by all parties.

Outcomes: 15 workshops by May 2000, 10 or more workshops each year after, depending on demand. Based on pilot tests attendance would range from 8 to 30 per meeting with an average of 20.

The WSEP will be offered to Watershed Councils, technical committees, across the state. With improved information and processes Basin plans should be speeded up. Better partnerships and cooperation will result.

Outcomes: 6 meetings with an average attendance of 25 by May 2000, 5 or more workshops each year after, depending on how fast basin plans are developed.

3. Stabilize stream banks, increase shading, and improve riparian vegetation, of target streams: Landowners in the upper portion of the Malheur Lake Watershed have agreed to participate with OSU in a stream temperature project. It is hypothesized that changes in livestock management along the stream channel will result in narrowing and deepening of the channel resulting in reduced maximum summertime stream temperature. Grazing strategies designed to improve stream channel morphology will be developed and tested.

Extension Agent and Specialists in cooperation with SWCD and other agencies will target one to five streams in about 15 counties, total about 30 steam segments in the state. Stream segments chosen will have riparian, bank stabilization problems due to livestock grazing. Management changes instituted may include off stream watering, hardened crossings, exclusion electric fencing, tree or shrub planting, changes in season of use, changes in livestock intensity and distribution methods.

Photo points will be established and flow and water temperature data will be taken June through September. Phosphate and Nitrogen analysis will be run. If P and N are high samples further up stream will be taken to try and determine a source area or point or if it is high up in the watershed and could be from parent material. Data will be summarized in December each year and a report published on the results.

Tours of the sites, workshops and meetings will be utilized by Extension to show the results. Land managers will be encouraged to consider the changes for their operations and incorporate them in their water quality plans. Watershed councils and individuals will be encouraged to seek GWEB, CREP and other funds for cooperative projects. Again, action through participation will conquer individuals distrust and fear of the process.

Outcomes: Approximately 30 stream segments with improved riparian vegetation, bank stabilization, and shading. Thirty stream segments with an indication of phosphate and/or nitrogen loading. At least that many tours and meetings showing the results. Expanded use of the techniques to other streams. Greater appropriate use of GWEB, CREP and other funding. Greater cooperation between neighbors and agencies.

4. Assess watershed health (temperature) on representative stream types in Eastern Oregon: Extension Agents and Specialists will identify 12 stream segments, 4 each of the 3 representative types of streams that are in the best PFC that can be found. Photo points will be established and flow and temperature instruments installed. Flow and temperature data will be taken every two weeks June through September. Phosphate and Nitrogen analysis will be done. Correlation between temperature, stream type, and stream morphology will be analyzed. Temperature response to stream conditions between these stream segments and the segments where problems exist will be compared establishing base line data which at this point does not exist.

Outcomes: findings and conclusions should show the differences in temperature, if any, between these representative stream types in Eastern Oregon. They will also show if it is possible to predict how much temperature varies by condition. Regardless if it is possible to predict temperature this information should assist land managers in resource decisions. With better information people will feel more comfortable

developing individual plans. Agencies will be better able to determine if water temperature standards need to be modified. There will be a good indication if other quality factors may play a role in water quality, i.e. phosphate and nitrogen.

f. Methods

1. Reduce sedimentation in salmon streams from dryland farming: In winter '99-'00 a series of Extension meetings will be promoted through newsletters and the media. The subject matter will be annual crop alternatives, contracts, agronomics and economics, no-till seeding technology compared to conventional seeding and the producer incentive available for no-till, $10/acre up to 200 acres for one grower. A typical custom cost for drill and tractor is $23/ acre. A letter to all growers in each dryland wheat growing county will detail the cost share available for no-till seeding with a list of drills available. A sign up sheet will be included. As growers sign up Agents and/or Specialist will make one on one contacts and coordinate with the drill operators. Also included will be a request form for assistance in conservation-till annual cropping.

Growers will be encouraged to have side by side comparisons of conservation-till annual crop and no-till annual crop using the growers and custom equipment. Other comparisons such as fertilizer rates or placement that can have crucial effects on annual crop success will be suggested. Crop stand counts will be taken. If side by side comparisons are established yield data will be taken with grower's combines and the OSU Experiment Station weigh wagons. Field yields will be taken in all cases based on grower's records.

	Growers	Acres
No-till acreage targets by county are: Umatilla	20	4,000
Morrow	5	1,000
Gilliam	5	1,000
Sherman	10	2,000
Wallowa	14	3,000
Wasco	10	2,000
	64	13,000

Besides the no-till annual crop a minimum of 10,000 acres annual crop seeded conservation-till will be consulted on and monitored. It could result in much more acreage. Final results will be compiled and conclusions drawn in December so the information can be shared for the next years round of meetings and planting.

2. Promote public outreach and encourage education in watershed and resource management and protection: Workbooks for the individual water quality plan workshops and for the WSEP will be printed in November 1999. At the same time workshop schedules will be decided and promotion of the meetings began. Coordination with ODA, DEQ and SWCD and NRCS personnel and Watershed Councils for these meetings will also commence.

Workshops will be scheduled in January, February and March 2000. Follow up one on one consultation will be scheduled as needed.

Reports of attendance and follow up consultations will be compiled. Evaluations will be conducted at the close of each meeting. An assessment will be made on how many complete plans after attending the individual planning workshops. Some plans may be completed more than a year after attending so a running count will be maintained.

3. Stabilize steam banks, increase shading, improve riparian vegetation on targeted streams: About November, 1999, in cooperation with landowners in the upper Malheur Lake Watershed, grazing strategies designed to improve stream channel morphology will be developed. Eighteen monumented cross-sections, six per pasture, were surveyed in September 1998. Baseline stream temperature data was taken from June through September 1998. Channel material will be determined using the Wolman (1960) pebble count method and streamside vegetation will be assessed using the Greenline method (USDA 1992). Stream temperature data will be recorded continuously at each of the cross-sections with Hobo temperature sensors. Willow sprouts will be tagged and leader length measured.

Analysis of variance and regression analysis will be used. This is a replicated study and can be subjected to rigorous statistical interpretation.

In March and April 2000, Agents, Specialists and coordinators will work with land manager cooperators to identify up to five stream sites in each targeted county. Sites will have bank and riparian problems from livestock grazing. This will include the Malheur Lake grazing strategy effort. An assessment in April and May of each site will be made to determine what management changes and tools would correct the problems.

In May and June PFC assessments will be made of each site. In June management changes and tools will be installed, i.e. nose pumps, solar or gravity off stream water, electric fence, hardened crossings, etc. Student help will be hired in June and flow and temperature instruments installed. Photo points will be established. Measurements will be taken every two weeks through September. Water sample will be taken and sent to OSU for phosphate and nitrogen analysis. Notes will be taken on livestock distribution, duration and intensity of grazing, changes in stream morphology, etc.

In October and November data will be analyzed. Comparisons between stream types and PFC will be made over winter. Final reports will be done in February.

4. Assess watershed health (temperature) on representative stream types in Eastern Oregon: In March, April and May, 2000, OSU Rangeland Resources along with Agents and Specialists will choose 12 streams in the best PFC that can be found, four from each of the representative types. Land manager cooperation will be obtained. A formal PFC assessment will be conducted. In June flow and temperature devices will be installed. The same summer student help as used in the stream sites with problems will be utilized to collect data every two weeks through September. Water samples for nutrient analysis will be taken and sent to OSU. Photo point will be established. Photos will be good for future reference and educational meetings and displays.

In October and November data will be analyzed and comparisons made between stream types, PFC classes, flow and temperature. Final reports will be done in February and submitted to the appropriate parties.

g. Facilities and equipment

The Columbia Basin Agriculture Experiment Station has two weigh wagons that are committed for the dryland cropping part of the project. Extension offices and the Moro Experiment Station will be the site for the dryland coordinator. One computer will be purchased.

The workshops and meetings will only require equipment already owned by OSU Extension.

The water quality parts of the project will require purchase of temperature devices (HOBOs) for each site; one used 386-laptop computer per agent for the HOBOs, one flow meter for each agent, sample containers for water and some miscellaneous equipment. Three extension offices will be the sites for each of the three regional coordinators. One coordinator/project manager will be housed on the OSU campus. Four computers will be purchased.

h. Budget

1. Reduce sedimentation in salmon streams from dryland farming:
Coordinator for conventional annual crop and no-till annual crop program. They will help agents pick sites and cooperators, coordinate equipment dealers, record site information, coordinate other needed research, i.e. fertilizer rate, timing, etc., record data, finalize reports. County government pays for Extension county support, these budgets must be supplemented for coordinators to be officed in Extension offices because their responsibilities are for a much larger area than one county.

coordinator salary	$40,000

other payroll expense (OPE) $12,800
travel between locations $ 4,000
assistance with county budget $16,000
repair & update Exp. Sta. weigh wagons $ 2,500

Producer incentives $10 per acre, up to 200 acres for any one grower who uses a no-till commercial drill.
13,000 acres per year $130,000/year

first year cost $205,300
coordinator computer one time cost $3,000
Total costs $208,300

2. Promote public outreach and encourage education in watershed and resource management and protection:

Individual planning workshops: Publish 300 workbooks @ $20

workbooks $ 6,000
agent travel $ 2,500
temporary help $ 8,000
first year and total cost $16,500

Any time Agents are away from assigned duties some reimbursement is made to their Extension office so the local workload can be maintained.

WSEP meetings and workshops: Publish 125 workbooks and support material @ $30

workbooks $ 3,750
materials, supplies $ 1,000
agent travel to meetings $ 2,000
first year and total $ 6,750
Total cost $23,250

3. Stabilize steam banks, increase shading, and improve riparian vegetation on targeted streams:

Three coordinators for water quality monitoring and riparian area rejuvenation effort (Columbia Basin, Central OR, and Snake River areas). They will help agents pick cooperators and sites, coordinate equipment and management changes, analyze data and complete and file reports. Will be housed in area Extension offices.

three coordinator salaries $ 40,000 x 3 $120,000
OPE $ 12,800 x 3 $ 38,400
assistance for county Extension budgets $ 16,000 x 3 $ 48,000
travel for coodinators to sites $ 4,000 x 3 $ 12,000

One coordinator/project manager to assist the PIs. There is not enough time with other assigned duties for the PIs to do it all.

salary $50,000
OPE $16,000
assistance for county Extension budget $16,000
travel to offices & sites $ 5,000

Cost for part time temporary help June through September, 2 for each of 15 agents involved. Measurements and data collection every two weeks through the summer.

temporary help $ 3,000 x 15 $ 45,000
Cost for agent local travel and PFC training $ 1,000 x 15 $ 15,000
Cost for nutrient water samples @ $20 x 3 $ 60 x 30 $ 1,800
first year cost $367,200

Computers for coordinators, one time cost $ 3,000 x 4 $ 12,000
Flow measurements, 1 meter per agent $ 2,500 x 15 $ 37,500

Cost for temp measurement per site 10 HOBOs each site @ $100

HOBOs for about 30 sites	$ 1,000 x 30	$ 30,000	
50 meter tape per agent	$ 40 x 15	$ 600	
permanent locators per site	$ 100 x 30	$ 3,000	

Producer incentives to land managers for off stream watering equipment, crossings, electric fence, solar panels, planting, etc. limited to cash costs

Per site $ 2,500 x 30	$ 75,000	
one time cost	$158,100	
Total costs		$525,300

4. Assess watershed health (temperature) on the dominant stream types in Eastern Oregon: The flow meters, temporary help, local travel, tape measure will be already in place with the involved agents and coordinators.

Cost for nutrient water samples @$20 x 3 $ 60 x 12 $ 720

Travel for OSU Rangeland Resources to do PFC training and assessments, assist with choosing streams, overseeing the entire project $ 7,000

first year cost $7,720

Cost for temp. measurement per site 10 HOBOs @ $100 each site

HOBOs for 12 sites	$ 1,000 x 12	$12,000	
permanent locators	$ 100 x 12	$ 1,200	
one time cost		$13,200	
Total cost			$20,920

Budget Note: This grant would place five coordinators in five Extension offices in Oregon. This would require resources (secretarial support, phones, office supplies, space, desks, etc.). In the Extension system Extension Agent salaries are paid from state and federal funds. All other county support for Extension offices around the state comes from County government. County government, and as a result Extension County budgets, were severely impacted by Measure 50. County budgets took a 12% to 20% budget cut.

Consequently, we can not put additional personnel in county offices and expect them to be supported without including supplements to those budgets. Therefor, this grant includes support help for County Extension budgets, $16,000 per coordinator.

Total costs for entire project: (indirect costs, see section 5)

	One time Costs	1st yr Costs	Total costs
Dryland Annual Cropping and No-Till	$ 3,000	$205,300	$208,300
Individual Workshops }		$ 18,500 }	$ 23,250
WSEP Workshops } Outreach & education		$ 4,750 }	
Stream Segment Habitat Rejuvenation	$158,100	$367,200	$525,300
Stream Type Temp. and Nutrient Measure	$ 13,200	$ 7,720	$ 20,920
	$174,300	$603,470	$777,770

Indirect OSU 20.3% $105,107 does not include incentives or expenses for counties above $25,000. Grand Total $882,877

Section 9. Key personnel

Principle Investigators:

William (Bill) Krueger, Extension Rangeland Specialist and Department Head, OSU Rangeland Resources, Corvallis OR. FTE 0.6 Extension Specialist

Mary Corp, OSU Extension Agent, Agronomy, Umatilla County, Pendleton OR. FTE 1.0 Extension Agent Agronomy

Project Contact: Michael (Mike) Stoltz, Regional Director, OSU Extension Service, Corvallis OR. FTE 1.0 Extension Administration

Other personnel will be Tamzen Stringam, John Buckhouse and Mike Borman, OSU Rangeland Resources Dept., and Extension Specialists and Agents in Oregon Counties.

Section 10. Information/technology transfer

The primary method of information/technology transfer for the Annual Crop and No-Till planting segment is one on one contact and consultation with growers. Extension Agents have the mailing lists, identified innovators, local advisory councils, radio, news articles and newsletters to make the initial contacts. When other management changes have been made this system has worked extremely well. Tours will be held to showcase annual crops and successful methods, including the no-till seeding technology. The system is already in place in Umatilla County because of the EPA grant. This grant expands it to the entire Oregon Columbia Basin dryland cropping area and continues it for four years.

Other Extension methods will include meetings and workshops with cooperator panels, speakers and research reports. Results, conclusions, recommendations will be transferred to growers and agency personnel through the media and agents newsletters. Year-end reports will be completed and distributed to the appropriate agencies. Results that are peer reviewed and accepted will be presented at professional meetings. Appropriate articles will be submitted to professional journals.

OSU Crop and Soil Sciences Department now has a web site. Research and demonstration results by specialists and agents are now posted as soon as they are received from the field. Information on this project will be available as soon as possible after data is analyzed.

The individual planning workshops will be scheduled through the County Extension offices and growers will be encouraged to attend by media reports and Agent's newsletters. Workbooks will be published and will be given to each participant. The local County Agent will make one on one follow up consultations. Tabulation will be done on how many participants develop a water quality plan. Year-end reports will be completed and distributed to the appropriate agencies.

The WSEP workshops for Watershed Councils and others will be promoted and scheduled through the local County Agent. A curriculum with workbooks and supporting materials will be published and distributed to all participants at the workshops. If requested a follow up meeting could be scheduled. An evaluation of the meeting effectiveness will be conducted and reported.

The stream segment riparian area rejuvenation information/technology transfer will occur with individual cooperators participating in the planning and implementation. In addition tours for other producers and agency personnel will be conducted. Extension meetings and workshops will be held in each county or counties involved. Results will be reported in Agents media releases and newsletters along with conclusions and recommendations. In addition the information will be on the OSU Rangeland Resources web page as the data are analyzed. Year-end reports will be completed and distributed to the appropriate agencies. Results that are peer reviewed and accepted will be presented at professional meetings and journal articles will be submitted.

The stream type temperature and nutrient analysis information transfer will also occur through Extension meetings and workshops, media releases and Agent newsletters. Ongoing reports to appropriate agencies and submitted presentations and articles for peer review will be extremely important methods of transfer. The information will also be on the Rangland Resources web page.

Information from all portions of this grant will be shared with local Watershed Councils, SWCD's, DEQ and ODA technical people in the field. Personal contact and hand delivered reports by local Extension Agents will expedite this process. All of these people will be asked to participate in various aspects of the projects as well as invited to tours, meetings and workshops.

Congratulations!